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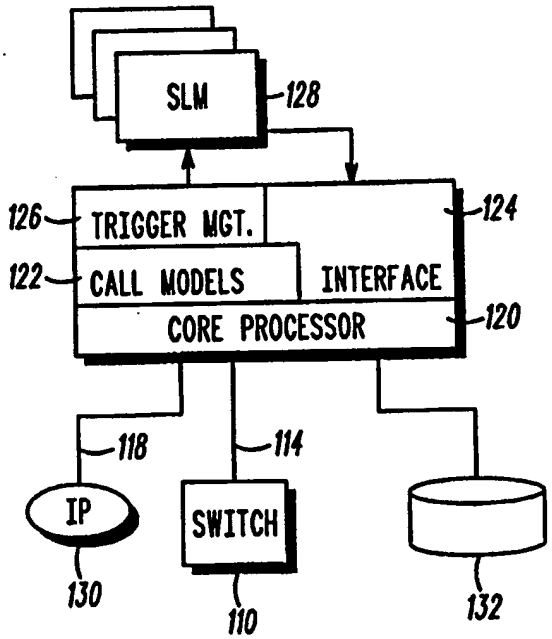
(54) Title: RADIOTELEPHONE SWITCHING SYSTEM AND METHOD OF PROVIDING RADIOTELEPHONE SERVICES

(57) Abstract

The present invention provides a radiotelephone switching system (60) and a method of providing subscriber services within a radiotelephone communication system (100). In a preferred embodiment of the present invention, a switch (110), typical of switches presently used in a telephone communication systems, is coupled to a processing platform (112) for enhancing its functional capabilities. The processing platform includes a trigger manager (124) for accessing a plurality of service modules (128) designed to provide services to the subscribers/users of the radiotelephone communication system.



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RADIOTELEPHONE SWITCHING SYSTEM AND METHOD OF PROVIDING RADIOTELEPHONE SERVICES

FIELD OF THE INVENTION

The present invention relates generally to communication systems, and more particularly, to switching systems for radiotelephone communication systems and to a method of providing services in a radiotelephone communication system.

BACKGROUND OF THE INVENTION

Communication systems are well known and consist of many types including land mobile radio, cellular radiotelephone, personal communication system (PCS), and other communication system types. In, for example, cellular radiotelephone communication systems, a number of communication cells, serviced by base transceiver stations (BTS), are typically linked to a base station controller (BSC). The BSCs are, in turn, linked to mobile switching centers (MSCs) which provide a connection between the cellular radiotelephone communication system and the public switched telephone network (PSTN) as well as interconnection of various cellular radiotelephone communication systems. Mobile communication units operating within the communication cells utilize radio communications to transmit and receive signals with the serving BTS. The signals are processed by the BTS, BSC and MSC to complete a communication transaction with a land line telephone user connected to the PSTN or to another mobile.

The MSC of a radiotelephone communication system is typically a complex system integrating telephony switching elements with radiotelephone communication system specific aspects such as signaling, control, etc. These systems are complex to build, to maintain and to upgrade. For example, the hardware and software architecture of such radiotelephone switching systems require subscribers services functionally integrated into the proprietary operating software of the MSC. To add to, upgrade or otherwise change the ability of the MSC to

provide subscriber services requires changes in the MSC operating software, usually at considerable expense and development time. Because of this, the addition of software features for providing enhanced services to the system subscribers is severely limited.

Recently, it has become known to construct wireline communication systems using an intelligent network architecture. Such an architecture is described in Intelligent Networks, Jan Thörner, Chpt. 2, Artech House 1994. The essence of a communication system constructed in accordance with intelligent network technology is centralized service control typically provided by a service control point (SCP) processor(s). Traditionally, service control was implemented at the switching system similar to the above-described MSC. The advantage of an intelligent network architecture implementation is that software, in the form of service logic modules (SLMs), required to provide services within the communication system operate on the SCP, i.e., a stable platform that seldom changes. To add new services or change existing services, only the parts of the SLMs that are unique to the service require design or revision. This greatly reduces the time to develop and implement new services or to adapt or upgrade existing services.

Unfortunately, these known intelligent network implementations have not proven well suited for wireless communication systems such as radiotelephone communication systems. For example, in wireline systems the subscriber, i.e., the telephone system customer, has a fixed location and appearance to a servicing wireline switch. The provisioning of triggers, i.e., points in the call processing indicating initiation of a special service or feature at an SCP, are easily implemented in the switch servicing the subscriber. However, in radiotelephone communication systems, subscribers may roam from system to system. Therefore, the triggers for the subscriber would have to be redundantly provisioned in multiple systems. Additionally, the known intelligent network implementations require intelligent peripherals (IPs, hardware which implement certain specialized functions) to be directly controlled by the switch.

The ability of radiotelephone system operators to win new subscribers will turn on their ability to provide new services quickly and cost effectively. Therefore, the success of radiotelephone system manufacturers will turn on an ability to provide systems to which new services may be easily added and/or upgraded. Thus, there is a need to adapt intelligent network technology to radiotelephone communication systems overcoming the limitations of such technology as applied to wireline communication systems.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is block diagram of an exemplary cellular radiotelephone communication system which may incorporate the present invention;

FIG. 2 is block diagram of a radiotelephone switching system in accordance with a preferred embodiment of the present invention;

FIG. 3 is, in accordance with a preferred embodiment of the present invention, a functional block diagram of the service control point processor of FIG. 2;

FIG. 4 is a bubble diagram illustrating the functional inter-relationship of elements in accordance with a preferred embodiment of the present invention of the service control point processor of FIG. 2;

FIG. 5 is a block diagram illustrating service action trigger dispatching in accordance with a preferred embodiment of the present invention;

FIG. 6 is a block diagram illustrating effective subscriber service provisioning determination in accordance with a preferred embodiment of the present invention;

FIG. 7 is a block diagram illustrating effective subscriber service status determination in accordance with a preferred embodiment of the present invention;

FIG. 8 is a block diagram illustrating digit pre-translation in accordance with a preferred embodiment of the present invention; and

FIG. 9 is a bubble diagram illustrating functional inter-relationship of elements of the service control point processor of FIG. 2 in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

The present invention provides a radiotelephone switching system and a method of providing subscriber services within a radiotelephone communication system. In a preferred embodiment of the present invention, a switch, typical of switches presently used in a telephone communication systems, is coupled to a processing platform for enhancing its functional capabilities. The processing platform includes a trigger manager for accessing a plurality of service modules designed to provide services, typically provided within proprietary processing software of the MSC, to the subscribers/users of the radiotelephone communication system. The trigger manager provides for provisioning of services and intelligent dispatch of triggers within the switching system. Additional services and features may be added to the radiotelephone communication system at any time by simply adding additional service modules. By providing the trigger manager numerous service modules may be developed and implemented independent of any proprietary processing associated with the switch. Moreover, redundant provisioning of services in multiple systems is not required to provide seamless services to roaming subscribers.

Referring to FIG. 1, the radiotelephone communication system 100 includes a plurality of BTSs 21 - 23 serviced by BSCs 31 - 33 as shown which makes up the base station system (BSS) 50. BSCs 31 - 33 are coupled to an MSC 60 which in turn is coupled to the PSTN 70. Mobile communication units (one of which is shown as mobile 80) operate in communication cells serviced by BTSs 21 - 23 and communicate with BTSs 21 - 23 via radio links in a known manner. Calls originating with or terminating at mobile 80 are processed through MSC 60 to either a wireline telephone customer linked to PSTN 70 or the other radiotelephone communication system users serviced by MSC 60 or other MSCs (not shown).

With reference to FIG. 2, MSC 60 includes a switching system (switch) 110 coupled to a service control point (SCP) processing platform 112 via signaling links 114. Switch 110 may consist of a

switching system commonly employed in radiotelephone communication systems, or may comprise a Class 5 telephony switch incorporating intelligent networking (IN) capabilities. SCP 112 may be any suitable processing platform. Signaling between SCP 112 and switch 110 is preferably according to a standard protocol such as Interim Standard (IS - 41) published by EIA/TIA, or the distributed mobile exchange (DMX) protocol and enhanced versions thereof available from Motorola, Inc., Cellular Infrastructure Group, 1501 W. Shure Drive, Arlington Heights, Illinois 60004. Intelligent peripherals (IPs) 130 are also linked to switching system 110 via voice/data trunk 116 and to processing platform 112 via signaling link 118. Signaling link 118 in a preferred embodiment is a transmission control protocol/internet protocol (TCP/IP) based voice response interface (VRI) protocol, while voice/data trunk 116 is any voice/data trunk including T1, fiber optic, etc.

Referring to FIG. 3, the elements of SCP 112 are shown, generally in hierarchical relationship, to include a core processor 120 coupled to a call model processor 122 and an interface 124. SCP 112 further includes a trigger manager 126 coupled to both call model processor 122 and interface 124. Coupled to both trigger manager 126 and interface 124 are a plurality of service modules 128 which provide the functions for implementing subscriber services in radiotelephone communication system 100.

With continued reference to FIG. 3, core processor 120 is coupled directly to a plurality of IPs one of which is shown at 130 via signaling link 118 and by voice/data trunk 116 to switch 110. Core processor 120 is also coupled to a database system 132 which stores, among other things, the radiotelephone communication system and subscriber provisioning and status information as will be described. In addition to interfacing with IPs 130, switch 110 and database 132, core processor 120 provides additional functions such as transaction context management and transactions capabilities applications part (TCAP) as provided in the signaling system 7 (SS7) protocol for routing data.

Call model processor 122, in the preferred embodiment, is a finite state machine which maps the interface protocol on link 118, i.e.,

DMX call processing messages, into the Bellcore Advanced Intelligent Network (AIN) call model. At certain states, processing is suspended by call model processor 122 and trigger manager 124 is activated for providing specialized services or features. Trigger manager 124 provides for implementing subscriber services through intelligent instruction and dispatch of event triggers and service action triggers to the SLMs 128.

FIG. 4 shows the inter-relationship of functional elements within switching system 110 for providing call processing. Central is the call process related function 200 which as noted above in a preferred embodiment is the Bellcore AIN call model. Several trigger enhancements to the Bellcore call model are made possible through implementation of the present invention and are described below. Additional elements are the digit pre-translation function 202 and non-call process related function 204.

Also shown in FIG. 4 are trigger event dispatch function 206, service action dispatch function 208 and determine service status function 210 which are provided and administered by trigger manager 124. Trigger dispatch event function 206 is responsible for converting an event trigger into a prioritized list of potential service actions. The service action list is generated from the service definition table 214 which is accessed in an associative manner with an event trigger identification (ID) and is communicated to service action dispatch function 208.

With reference to FIG. 5, service action dispatch function 208 provides for dispatching service action triggers, i.e. dispatching triggers to SLMs, based upon the service action list, information in the service switch table 216 and effective subscriber service indicators. This information provides service action dispatch function 208 with a basis for determining whether a service action trigger should be dispatched, i.e., whether the service is provisioned, its status is active and the service action is invoked. In the preferred embodiment, service action triggers are dispatched according to the criteria contained in Table I below. The effective subscriber service indicators include effective subscriber provisioning indicators and effective subscriber service

status indicators which are generated by determine service status function 210. Service action dispatch function 208 also utilizes service scope, service ID and service action ID information for identifying SLM triggers within service switch table 216. Service action dispatch function 208 continues to dispatch service actions, i.e., SLM triggers, until the service action list is exhausted or an SLM returns a trigger response other than continue. Upon exhausting the service action list or receiving an other than continue trigger response from an SLM, service dispatch function provides a trigger response to call process function 202. This trigger response is either continue, if all service actions on service action list are exhausted or the non-continue trigger response from an SLM.

In the preferred embodiment, the service definition table contains service scope, service ID, service name, service mnemonic, service priority, service state handling, and trigger event list fields. The service scope field defines the level at which the service is provisioned. That is, if

Effective Subscriber Service Provisioning Indicator	Potential Service Action	Effective Subscriber Service Status Indicator	Dispatch Decision
Withdrawn	Don't Care	Don't Care	No
Provisioned	Invoke	Active	Yes
Provisioned	Invoke	Inactive	No
Provisioned	NOT Invoke	Don't Care	Yes

TABLE I

Subscriber Service Provisioning Control	Subscriber Service Provisioning Indicator	Feature Package Provisioning Indicator	Effective Subscriber Service Provisioning Indicator
Withdrawn	Don't Care	Don't Care	Withdrawn
Provisioned	Provisioned	Provisioned	Provisioned
Provisioned	Withdrawn	Provisioned	Provisioned
Provisioned	Provisioned	Withdrawn	Provisioned
Provisioned	Withdrawn	Withdrawn	Withdrawn

TABLE II

Subscriber Service Status Control	Per Call Subscriber Status Control	Subscriber Service State Handling	Subscriber Service Status Indicator	Effective Subscriber Service Status Indicator
Disabled	Don't Care	Don't Care	Don't Care	Inactive
Enabled	Disabled	Don't Care	Don't Care	Inactive
Enabled	Enabled	ActiveOnly	Don't Care	Active
Enabled	Enabled	Variable	Inactive	Inactive
Enabled	Enabled	Variable	Active	Active

TABLE III

the service is a system level service applicable to all subscribers or a subscriber level service provisioned individually to all subscribers. The service ID, service name and service mnemonic fields provide means for identifying a particular service. The service priority field contains data which provides for determining an order in which service actions are dispatched in response to a common event trigger. The service state handling field contains data used to specify the type of state handling the service employs, either active or variable. The trigger event list contains the trigger events which a particular service need for operation. The trigger event list also contains the event ID and service action ID which may be one of the following: Activation, Deactivation, Registration, Erasure, Interrogation, Invocation, Service Specific 1 or Service Specific 2. In operation, trigger dispatch function 206 uses the event trigger ID to identify the service actions associated with a particular event trigger. The service priority data is then used to order, in a prioritized fashion, the service actions into the potential service actions list which is then communicated to the service action dispatcher 208.

Determine service status function 210 calculates the effective subscriber service provisioning and status indicators which are required for proper support of SLM execution and call processing. With reference to FIG. 6, feature provisioning information is combined from a field of the system profile 230 and a field of the subscriber profile 232 to determine an effective subscriber service provisioning indicator 240. In a preferred embodiment, duplicate provisioning of subscriber features in both subscriber profile 232 and in a feature package table 234 allows for continued use of feature packages. System profile 230 provides a centralized means for provisioning services on a system wide basis, while subscriber profile 232 and feature package table 234 provide means for provisioning services on a per subscriber basis. Exemplary effective subscriber provisioning indicators are indicated in Table II above.

Next, with reference to FIG. 7, subscriber service status information is combined to provide an effective subscriber service status indicator 242. In a preferred embodiment such information

includes subscriber service status information from a field in the system profile 232, per call subscriber service status information from a field in the subscriber profile 234, subscriber service status handling information from a call occurrence field 236 and subscriber service status indicators from service definition table 214. Exemplary effective subscriber service status indicators are indicated in Table III.

In response to a service action trigger from service action dispatch function 208, the SLMs perform various functions in support of subscriber services and features. These include causing a forward or a redirect of a terminating call, paging a mobile subscriber, initiating call waiting, etc. Under normal conditions an SLM will provide a trigger response of continue, which indicates that the call process function 202 should continue without regard to the SLM processing, or another response instructing the call process function 202 to take some action with respect to the current call. A failure response may also be returned indicating that a general failure occurred during processing of the service action.

With reference once again to FIG. 4 and further reference to FIG. 8, pre-translation function 202 is also provided within switching system 110. Pre-translation function 202 converts the subscriber originating class of service (OCOS) to a dialing plan 252 through the use of an OCOS conversion table 254. The subscriber OCOS is retrieved from a field within subscriber profile 232. The dialing plan ID and any collected digits, i.e., digits input by the subscriber in addition to the requesting a service, are matched to an entry in the pre-translation/dialing plan table 252. The entry in the table identifies either a trigger event ID which is communicated to trigger event dispatch function 206 or a service action which is communicated to service action dispatch function 208 for appropriate action.

SCP 112 through trigger manager 126 further provides for maintaining statistics on services used 260, and one messaging with switch 110. This is accomplished through dispatch of appropriate triggers to statistic SLMs for updating theses statistics.

As will be appreciated, by adding additional triggers within the call model, and corresponding SLMs, numerous additional services

and features may be added to switching system 110 with minimal investment and engineering effort. This is illustrated in FIG. 9 where several additional triggers have been added to call process function 202, each shown separately in FIG. 9 as 1202, 2202, 3202, 4202 and 5202. Triggers 1202 and 2202 provide for call origination and termination, respectively, in accordance with the Bellcore call model. Trigger 3202 provides for autonomous registration of the mobile subscriber in radiotelephone communication system 100. Upon receipt of a I_ROAM_UPDATE message, call process function generates an autonomous registration trigger event which is communicated to trigger event dispatch function 206 of trigger manager 124. In accordance with a preferred embodiment of the present invention, trigger manager 124 will cause the dispatch of service actions to the appropriate SLM for registering the mobile subscriber in radiotelephone system 100. If registration is successful, the mobile subscribers status is updated in the subscriber status table 238 by the SLM and a continue is returned as the trigger response. Similarly, such additional services as feature update 4202 and remote feature update 5202 are implemented via the addition of appropriate triggers within call process function 202 and SLMs.

As will be appreciated from the foregoing, the advantages of intelligent network technology are made applicable to radiotelephone communication systems through the introduction of trigger manager 124. Trigger manager 124 provides for prioritization and provisioning of subscriber services on a per subscriber basis and without requiring redundant provisioning in multiple systems. Moreover, subscriber features and services are easily added to a system without extensive costs and delays for development.

We Claim:

CLAIMS

1. A radiotelephone communication system switching system comprising:

a switch coupled to a public switched telephone network and to a radiotelephone communication system,

a processing platform coupled to the switch and to the radiotelephone communication system, the processing platform including a trigger manager, and

a plurality of service modules, responsive to the trigger manager, and coupled by an interface to the processing platform.

2. The switching system of claim 1 wherein the trigger manager comprises a service action list.

3. The switching system of claim 2 wherein the service action list comprises a set of systems controls logically combined with a set of subscriber states.

4. The switching system of claim 3 wherein the service action list is prioritized.

5. A method of providing radiotelephone services in a radiotelphone communication system having a switching system coupled to a base station system and to a processing platform, the method comprising:

(a) converting an event trigger into a list of potential service actions;

(b) determining a first service action contained on the list to be dispatched; and

(c) dispatching the first service action.

6. The method of claim 5 further comprising the steps of:

(d) determining a second service action contained on the list to be dispatched; and

(e) dispatching the second service action.

7. A system for providing radiotelephone services in a radiotelphone communication system having a switching system coupled to a base station system and to a processing platform, the system comprising:

means for converting an event trigger into a list of potential service actions;

means for determining a first service action contained on the list to be dispatched; and

means for dispatching the first service action.

8. The system of claim 7 wherein the list comprises a logical association of an event trigger identification with a service definition table.

9. The system of claim 7 wherein means for determining is operable for determining an effective subscriber service provisioning indicator.

10. A system for providing services in a radiotelephone communication system comprising:

means for managing dispatch of action triggers from a switching system to a processing platform coupled to the switching system, the means for managing comprising:

means for creating a list of service actions;

means for determining an effective subscriber service provisioning indicator;

means for determining an effective subscriber service status indicator; and

means for dispatching a service action trigger to the processing platform based upon the effective subscriber service provisioning indicator and the effective subscriber status indicator.

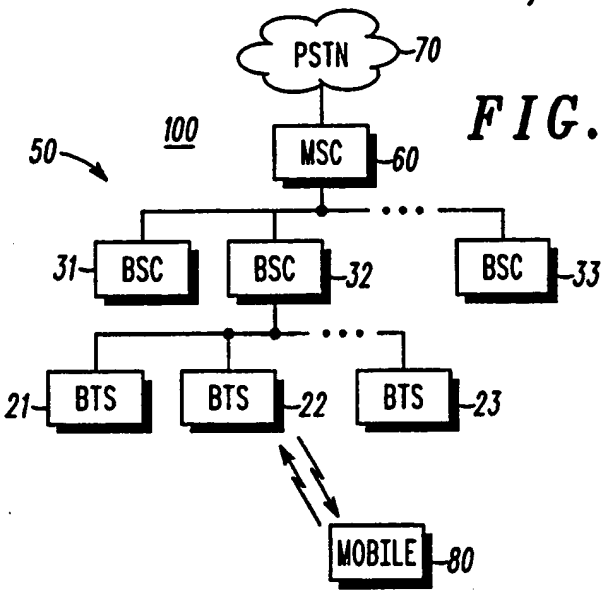

FIG.1

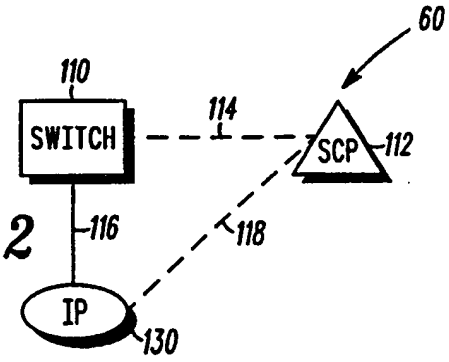

FIG.2

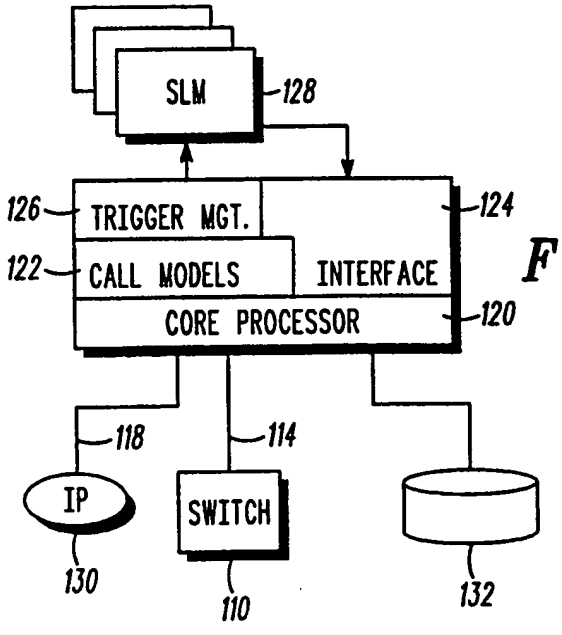

FIG.3

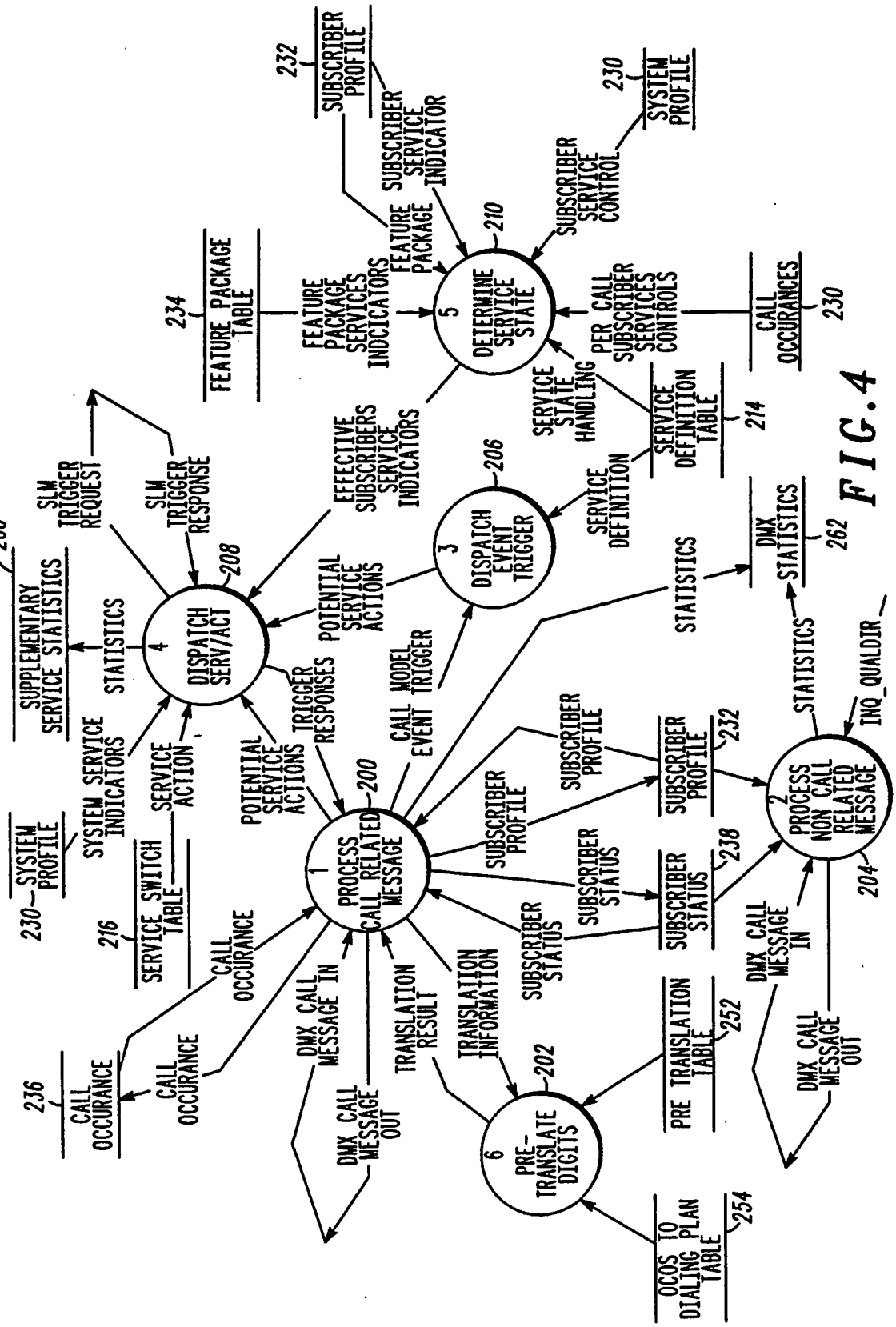
1 PROCESS CALL RELATED MESSAGE 200
2 PROCESS NON CALL RELATED MESSAGE 204
3 DISPATCH EVENT TRIGGER 206
4 DISPATCH SERV/ACT 208
5 DETERMINE SERVICE STATE 210
6 PRE-TRANSLATE DIGITS 202
SUPPLEMENTARY SERVICE STATISTICS 260
SYSTEM PROFILE 230
SERVICE SWITCH TABLE 216
CALL OCCURANCE 236
FEATURE PACKAGE TABLE 234
SUBSCRIBER PROFILE 232
SYSTEM PROFILE 230
SERVICE DEFINITION TABLE 214
CALL OCCURANCES 230
DMX STATISTICS 262
PRE TRANSLATION TABLE 252
SUBSCRIBER STATUS 238
OCOS IO DIALING PLAN TABLE 254
SLM TRIGGER REQUEST
SLM TRIGGER RESPONSE
SYSTEM SERVICE INDICATORS
SERVICE ACTION
STATISTICS
POTENTIAL SERVICE ACTIONS
TRIGGER RESPONSES
CALL OCCURANCE
DMX CALL MESSAGE IN
DMX CALL MESSAGE OUT
TRANSLATION RESULT
TRANSLATION INFORMATION
SUBSCRIBER STATUS
CALL MODEL EVENT TRIGGER
EFFECTIVE SUBSCRIBERS SERVICE INDICATORS
SERVICE DEFINITION
SERVICE STATE HANDLING
FEATURE PACKAGE SERVICES INDICATORS
FEATURE PACKAGE
SUBSCRIBER SERVICE INDICATOR
SUBSCRIBER SERVICE CONTROL
PER CALL SUBSCRIBER SERVICES CONTROLS
INQ_QUALDIR

FIG. 4

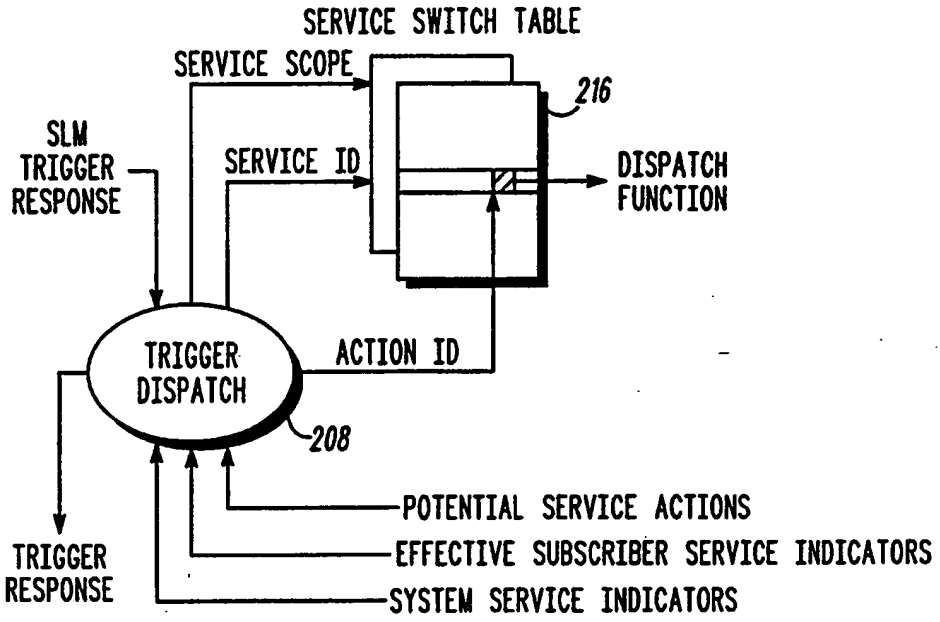
SERVICE SWITCH TABLE
SERVICE SCOPE
216
SLM
TRIGGER
RESPONSE
SERVICE ID
DISPATCH
FUNCTION
TRIGGER
DISPATCH
ACTION ID
208
POTENTIAL SERVICE ACTIONS
TRIGGER
RESPONSE
EFFECTIVE SUBSCRIBER SERVICE INDICATORS
SYSTEM SERVICE INDICATORS

FIG.5

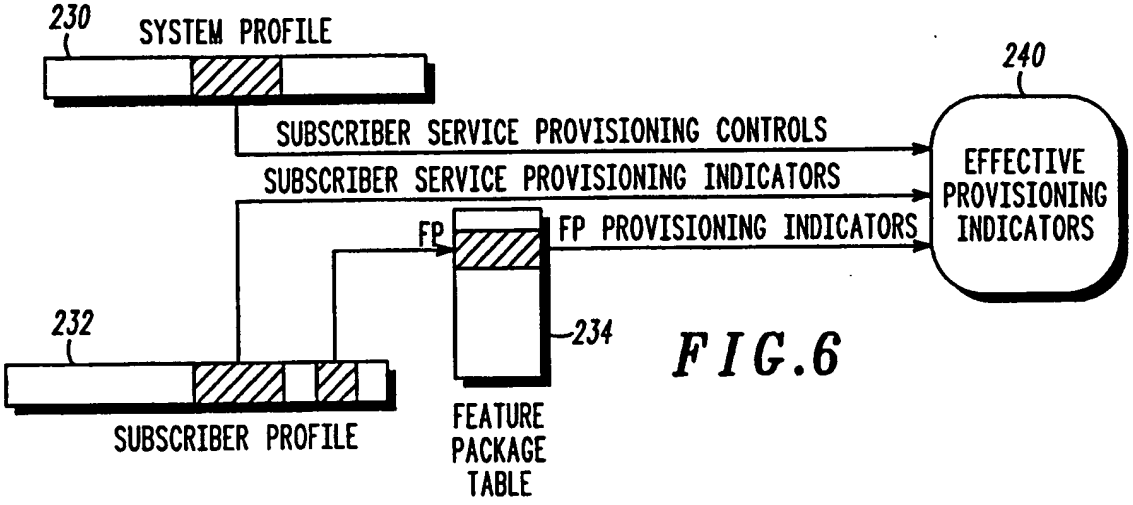
230
SYSTEM PROFILE
240
SUBSCRIBER SERVICE PROVISIONING CONTROLS
EFFECTIVE
PROVISIONING
INDICATORS
SUBSCRIBER SERVICE PROVISIONING INDICATORS
FP
FP PROVISIONING INDICATORS
232
234
SUBSCRIBER PROFILE
FEATURE
PACKAGE
TABLE

FIG.6

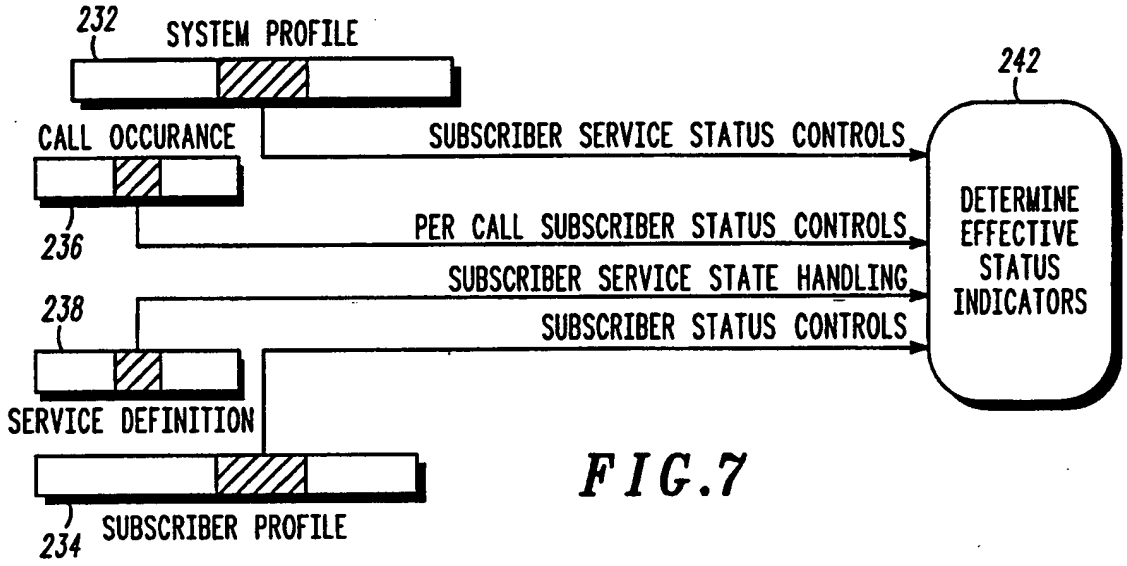
232
SYSTEM PROFILE
242
CALL OCCURANCE
SUBSCRIBER SERVICE STATUS CONTROLS
DETERMINE EFFECTIVE STATUS INDICATORS
236
PER CALL SUBSCRIBER STATUS CONTROLS
SUBSCRIBER SERVICE STATE HANDLING
238
SUBSCRIBER STATUS CONTROLS
SERVICE DEFINITION
234
SUBSCRIBER PROFILE

FIG.7

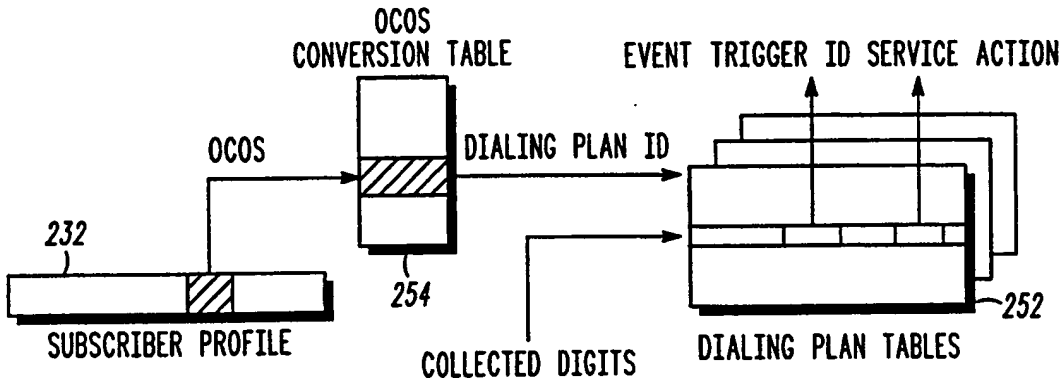
OCOS
CONVERSION TABLE
EVENT TRIGGER ID SERVICE ACTION
OCOS
DIALING PLAN ID
232
254
252
SUBSCRIBER PROFILE
COLLECTED DIGITS
DIALING PLAN TABLES

FIG.8

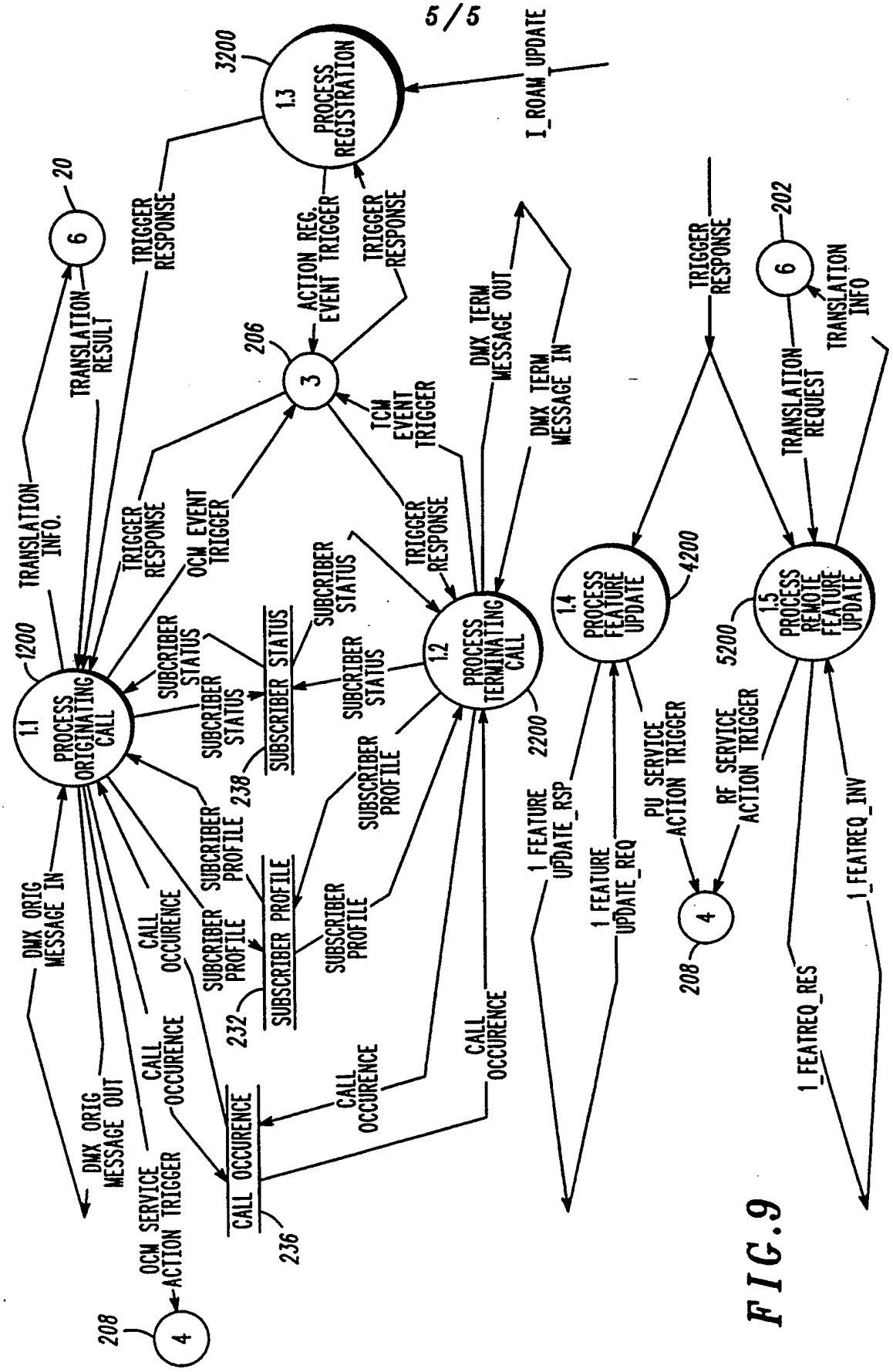
1.1 PROCESS ORIGINATING CALL
1200
1.2 PROCESS TERMINATING CALL
2200
1.3 PROCESS REGISTRATION
3200
1.4 PROCESS FEATURE UPDATE
4200
1.5 PROCESS REMOTE FEATURE UPDATE
5200
3
206
4
208
6
20
6
202
SUBSCRIBER STATUS
238
SUBSCRIBER PROFILE
232
CALL OCCURENCE
236
TRANSLATION INFO.
TRANSLATION RESULT
TRIGGER RESPONSE
ACTION REG. EVENT TRIGGER
OCW EVENT TRIGGER
ICM EVENT TRIGGER
DMX TERM MESSAGE OUT
DMX TERM MESSAGE IN
I_ROAM_UPDATE
DMX ORIG MESSAGE IN
DMX ORIG MESSAGE OUT
OCW SERVICE ACTION TRIGGER
1_FEATURE UPDATE_RSP
1_FEATURE UPDATE_REQ
PU SERVICE ACTION TRIGGER
RF SERVICE ACTION TRIGGER
TRANSLATION REQUEST
1_FEATREQ_RES
1_FEATREQ_INV

FIG.9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/05347

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04Q 1/10
US CL : 379/58
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/58

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 5,329,578 (BRENNAN ET AL) 12 JULY 1994, TABLES 1-5; FIGURES 1A, 1B, 2A; CL4., LNS. 19-66.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 12 JUNE 1996	Date of mailing of the international search report 12 JUL 1996
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